FOUNDRY TRADE JOURNAL
Established 1902
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

Vol. 76. Thursday, May 31, 1945. No. 1502

Ethyl Silicate

When Mr. Adam Dunlop read his Paper on "Precision Castings by the Lost Wax Process" to the Birmingham, Coventry and West Midlands branch of the Institute of British Foundrymen, he disclosed the use of a new sort of refractory—known chemically as ethyl silicate. It will be remembered that this functions by mixing with water, plus an electrolyte—probably of a proprietary nature—whereupon a chemical reaction takes place resulting in the production of colloidal silica and alcohol. This reaction can be accelerated by heat. The colloidal silica dries out to a hard glass-like material. This substance is mixed with moulding sand so as to form a sort of slurry, which is poured around the wax pattern, and beyond a few *tours de main* the mould is ready for baking. Using this process, the American foundry industry is said to have made extraordinary progress during the war. The extent of the use in this country has still to be disclosed. It is obvious that the use of ethyl silicate in foundry work need not be confined to the making of an investment material for the lost wax process, and an article received from America discloses several interesting applications. Sent to us from the Carbide & Carbon Chemicals Corporation of 30, East 42nd Street, New York City, the note reveals that porous sand moulds coated with ethyl silicate solution are hardened, strengthened and stiffened by the deposited silica. To obtain a smoother surface some filter may be incorporated in the ethyl silicate solution. Thus ethyl silicate solution is being used as a mould wash for the casting of such metals as magnesium. For this purpose, it is sprayed on the inner surface of a conventional two part sand mould and allowed to dry. Such treatment is said to yield a better casting surface, free from sand inclusions. Where graphite moulds are used as dies in non-ferrous work, it is suggested that spraying with ethyl silicate will prolong their life.

An interesting statement reads: "Steel castings are sometimes coated with finely ground ferro-chrome by pouring the molten steel into sand moulds coated with ferro-chromium. Ethyl silicate can be used to bond the powdered ferro-chrome to the surface of the sand mould." This statement has made us wonder whether it could similarly be used for making silicon carbide stick to the surface of iron castings for the production of potato peeler components. The final paragraph of this very interesting note from America deals with the production of a refractory. It says: "If pulverised silica is mixed with hydrolysed ethyl silicate solution and then allowed to air-dry, a hard, strong, slightly porous refractory and acid-resisting material is formed. Air-dried blocks produced by this method withstood a crushing load of over 2,000 lbs. per sq. in. and a temperature of over 1,500 deg. C. On heating or cooling, the strength of the blocks was reduced somewhat, but no spilling or serious deterioration developed."

The position in this country is that for a number of years ethyl silicate has been produced on a limited scale, associated with a fairly high price. Now this plant is being extended, and a second plant is being erected at Barry Docks which will shortly be in production. We have seen stainless-steel castings made in moulds which were formed through the medium of ethyl silicate, and it is virtually impossible to distinguish their surfaces from those of a well made die casting. Ethyl silicate has placed in the hands of the foundrymen the means of not merely competing with non-foundry products, but materially extending the existing boundaries.

THE LOST WAX PROCESS is being used for the production of "Alnico" magnets in the United States, where this process has been much expanded during the war.

Contents

Ethyl Silicate, 87.—Disposal Procedure for Government Surplus Machine Tools, 88.—New Catalogue, 88.—The Development and Application of Pattern Equipment for the Production of a Light Alloy Casting, 89.—A Convenient Form of Cast-on Indentation Hardness Test-piece, 96.—American Foundry Activity, 97.—Future of German Industry, 97.—Mould Design for Aluminium Bronze Die Castings, 98.—Simplified Working Drawings, 100.—A Departure from Standard Practice, 101.—New Patents, 103.—In Parliament, 104.—Personal, 104.—Finance Corporation for Industry, 104.—Company Results, 106.—New Companies, 106.—News in Brief, 106.—Obituary, 106.—Raw Material Markets, 108.—New Trade Marks, 108.

DISPOSAL PROCEDURE FOR GOVERNMENT SURPLUS MACHINE TOOLS

The centres set up by the Machine Tool Control in connection with the Government's scheme for making its surplus machine tools easily available for the re-equipping of British industry are now operating at Birmingham, Bristol, Glasgow, Leeds, London and Manchester. The complete stock records maintained at each of these centres may be inspected by intending purchasers, or merchants acting on their behalf, between 10 a.m. and 4 p.m. from Monday to Friday.

The method to be adopted in selecting and purchasing the machines is set out below, and it is essential that the procedure should be followed. Failure to comply will cause delay, and may result in the purchaser losing the opportunity of securing the machine required. This procedure does not apply when contractors wish to purchase Government-owned machines already in their possession.

Conditions of Sale

Sales of machines on the stock records are governed by standard conditions which make it clear that all machines are sold " as is," where lying, and will be loaded on the purchaser's vehicle. It follows, therefore, that the transport of the machines, any reconditioning necessary, and the supply of any additional equipment required must be arranged by the purchaser through trade channels on his own account. Purchasers will be required to sign an undertaking that the machines will be used on production in their own business. Purchase of machines for stock is not permitted.

The Machine Tool Control have recognised that many purchasers will decide that a merchant can help them by selecting suitable machines. In every instance, however, the sale will be directly between the Ministry and the user, and the sale price of the machine will be the same, whether or not the purchaser decides to use the services of a merchant in this way. The Ministry of Supply has made arrangements with a number of merchants by which the Ministry will pay them a commission for their services in selecting machines on behalf of users, if a sale results, and the user certifies that such services have been rendered. Lists of these approved dealers are available at the centres.

Selection and Inspection

The stock records are classified into main types and give brief specification, price, and location of every machine. For the convenience of prospective purchasers, forms are available at the centres on which they can copy details of the machines from the stock records. It is advisable that the information should be noted down carefully since it will be necessary for the purchaser to quote the references again when making an offer to purchase.

The bottom portion of the selection form is the intending purchaser's official permit to visit the stores to view the machines, but it is only valid after being stamped and signed by an officer of the Control at the centre.

Since all machines are offered " as is," it is, of course, advisable that they should be seen by the purchaser, or his representative, who may be an approved merchant inspecting the machines for him. It should be noted that there may be machines in store which are not available for sale, but offers will only be considered for machines which appear on the stock records.

Offers to Purchase

Offers to purchase must be made either directly by the purchaser, or by the approved merchant acting on his behalf, on the standard form which can be obtained from the centres, at the same time as the stores permit is endorsed. All offers to purchase must be sent to the Machine Tool Control, Directorate of Machine Tool Disposals, 35, Old Queen Street, Westminster, London, S.W.1. Offers will not be accepted at any other address, and they will be dealt with in strict rotation.

On receipt of an offer the Control will send an acceptance on the appropriate form direct to the purchaser, if the machine is still available. Where the offer cannot be accepted the purchaser will be so informed. Each acceptance of an offer will be sent to the purchaser in duplicate, and he must, within 14 days, return the duplicate copy of the form, with the undertaking regarding use signed, and his remittance for the full amount. The form provides a space which the purchaser completes if he has made use of the services of an approved merchant in obtaining the machine.

Following receipt of the form and remittance a release note will be issued by the Control authorising the collection of the machines, and it is the purchaser's responsibility to make the necessary arrangements directly with the stores concerned, so as to ensure removal of machines within 28 days.

NEW CATALOGUE

Dust Removal. Carrying the title, " Equipment for Enginering and Allied Industries," Davidson & Company, Limited, of Sirocco Engineering Works, Belfast, have issued a new catalogue covering much more than dust removal. But it is dust removal which is exercising the minds of foundry executives at the present moment. The catalogue deals briefly but adequately with the two distinct problems of general and local dust removal. Amongst the more interesting items is Fig. 19—the Sirocco industrial vacuum cleaner. Amongst other subjects dealt with are air conditioning; fume removal, including applications to crucible furnace installations, paint spray benches and booths; fans and pneumatic conveyors, including a portable plant which we do not remember having seen illustrated before. The catalogue runs to 48 pages and is well illustrated.

THE ANNUAL GENERAL MEETING of the Institute of Welding will be held at the Institution of Civil Engineers, Great George Street, Westminster, London, S.W.1, to-morrow (Friday), at 2.30 p.m.

THE DEVELOPMENT AND APPLICATION OF PATTERN EQUIPMENT FOR THE PRODUCTION OF A LIGHT ALLOY CASTING*

The requirements of the foundry are sometimes overlooked

By F. H. HOULT (Kent Alloys, Limited, Rochester)

"A casting is as good as the pattern from which it is produced." This axiom summarises the following Paper, in which the Author has set out to describe the different methods used and equipment necessary to produce varying quantities of a certain casting. Designers, buyers and users of castings are not, in general, sufficiently aware of the requirements of the foundry with regard to pattern equipment and the difficulties encountered in the production of consistent castings. It is very often the case that production hold-ups can be traced to the fact that insufficient attention had been given to the design of pattern equipment or that the type of patterns called for were not correct and sufficient for the standard and quality of casting required.

The casting shown in Fig. 1 forms part of a control column unit of a well-known fighter aircraft. The casting must be of a class 1A standard of Aeronautical Inspection Directorate requirements and must be dimensionally correct, consistent and radiologically sound. The part is neither intricate nor difficult, but serves to show several alternative methods of manufacture to suit different production demands.

Casting methods with their subsequent equipment provision are dependent on the following:—(1) Total

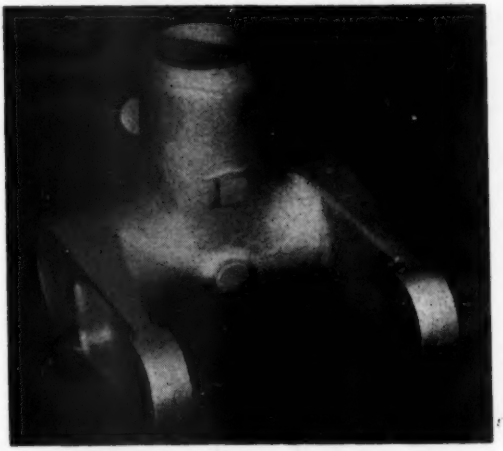


FIG. 1.—LIGHT ALLOY CASTING FORMING PART OF A CONTROL COLUMN FOR A WELL-KNOWN FIGHTER AIRCRAFT. SPECIFICATION DTD 304.

* A Paper read before the London Branch of the Institute of British Foundrymen and also presented to the Metropolitan Chapter of the American Foundrymen's Association.

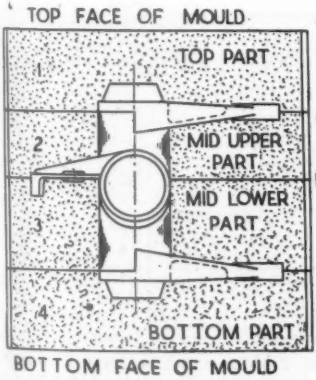


FIG. 2.—METHOD OF MOULDING PROTOTYPE CASTING. FOUR-PART MOULDING BOX.

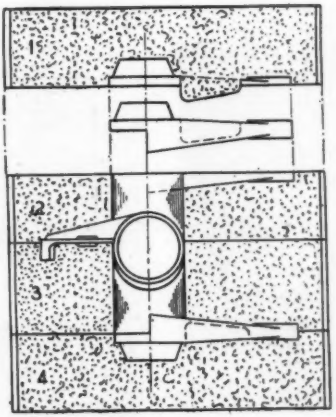


FIG. 2A.—METHOD OF WITHDRAWING PROTOTYPE PATTERN FROM THE MOULD.

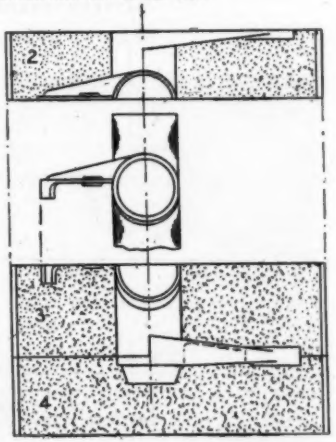


FIG. 2B.—METHOD OF SPLITTING THE PROTOTYPE PATTERN.

Development of Pattern Equipment

number of castings likely to be produced from that equipment; (2) the urgency of initial production demands; (3) facilities available; and (4) rate of production required. The requirements of the casting under consideration were that prototype or experimental castings were urgently required. Pattern equipment was to be produced which would enable castings to be available in the minimum time. The production requirements were such that it was decided that temporary wooden pattern equipment which could be manufactured quickly should be used while the patternmakers proceeded with all metal production patterns and coreboxes.

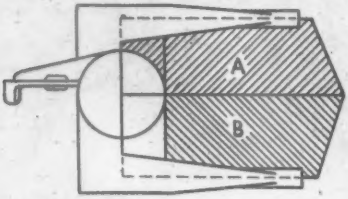


FIG. 3.—USE OF CORE TO ENABLE THE CASTING TO BE MADE IN A TWO-PART MOULD.

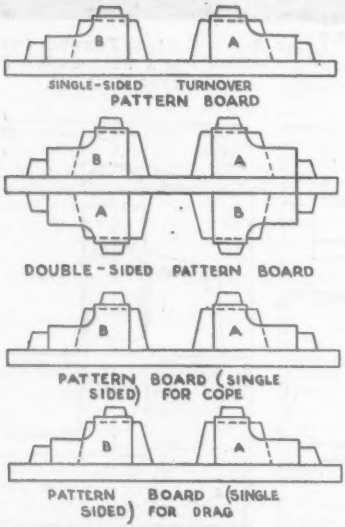


FIG. 4.—ALTERNATE METHODS OF PATTERN PLATE PRODUCTION.

Prototype Castings

The first decision of the patternmaker is the joint face or faces of the mould to produce the required casting. Fig. 2 shows how the mould joints are formed, while Fig. 2A shows how the pattern is removed from the mould, and Fig. 2B shows the method of splitting the pattern. For this equipment one core-

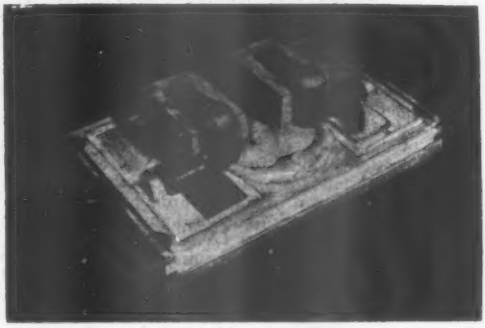


FIG. 5.—TURNOVER PATTERN PLATE WHICH PRODUCED BOTH COPE AND DRAG-PART MOULDS.

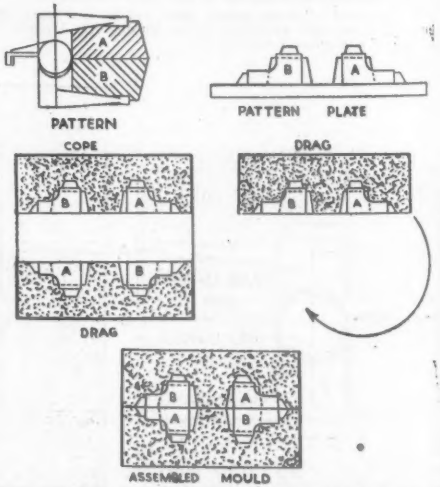


FIG. 6.—METHOD OF MOUNTING TWO HALF PATTERNS TO PRODUCE COPE AND DRAG-PART MOULDS.

box is required, that is, the circular section T core forming the inside of the casting. This pattern equipment is capable for use for only a small number of castings, and is to enable a mould to be made by a skilled hand moulder.

Preliminary Production Equipment

The equipment necessary to enable early production of quantities of the casting shown consists of wooden patterns mounted for use on a moulding machine. The size of moulding box available was such that two castings could be produced per mould. For moulding machine production a two-part mould is to be desired. Fig. 3 shows a section of the casting and illustrates how, by the use of a core to form the mould between the two arms of the casting, a two-part mould can be produced.

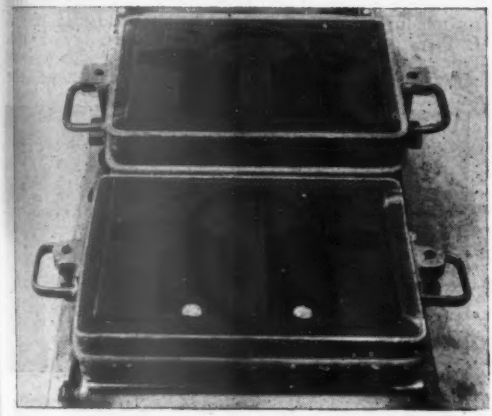


FIG. 7.—COPE AND DRAG-PART MOULDS FROM TURN-OVER PATTERN BOARD.

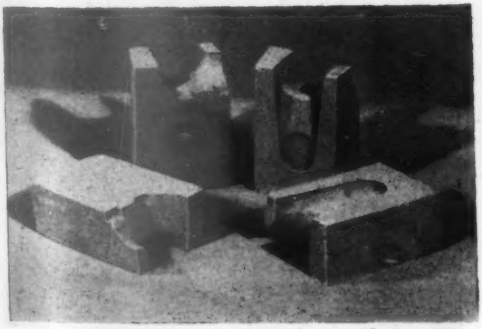


FIG. 9.—CORES FOR TURNOVER PATTERN BOARD.

Before proceeding to make his pattern, the patternmaker must know how it is proposed to work the equipment—whether one or two moulding machines are to be employed. The choice must be made between:—(*a*) A single-sided pattern which will produce both cope and drag part moulds; (*b*) a double-sided pattern board; and (*c*) two separate pattern boards. Fig. 4 illustrates these alternatives and Fig. 5 shows the single-sided turnover pattern plate. The pattern plate as shown in Fig. 5 can be produced in the least time and at the least cost.

Fig. 6 illustrates how the patternmaker makes a single split pattern and mounts the two half-patterns

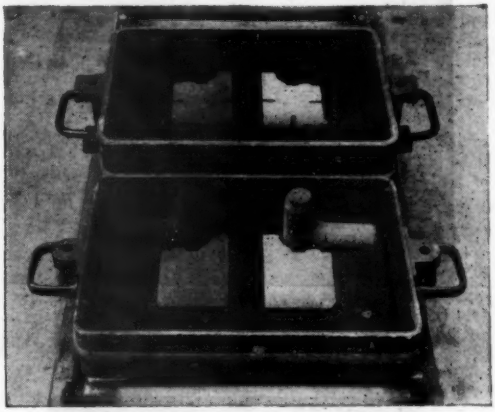


FIG. 8.—COPE AND DRAG-PART MOULDS FROM TURN-OVER PATTERN BOARD WITH CORES IN POSITION.

FIG. 10.—BEDDING-OUT FRAME FOR T-CORE SHOWING LOCATION OF COREBOX.

Development of Pattern Equipment

FIG. 11.—METHOD OF SUPPORT FOR BEDDING OUT FRAME AND COREPLATE DURING TURNING OVER OPERATION.

FIG. 13.—CASTINGS PRODUCED FROM TURNOVER PATTERN BOARD.

on a plate, equidistant from the centre line and in such a manner that the moulds taken from that pattern can be used as either a cope or a drag.

The point that the machine moulder or closer must watch is that, having placed his drag part mould, he must reverse the next part end to end in order to make it a top part mould. This is usually ensured by a distinction mark on one end of the mould. Fig. 6 also explains this procedure. It will be seen that the two castings produced from the mould are equal but opposite. This type of pattern plate construction can only be used when the two halves of the pattern are similar. Owing to the two castings being made in the opposite manner, runners and risers are not consistent and variations may occur.

A boss which is on the top side of one casting is on the underside of the adjoining casting. If the bosses are not equal and opposite, then variations, due to unequal shrinkage, etc., are likely to occur. A further trouble which may be encountered with this type of equipment is that, if there is any slackness of pins, or any variation or offset of the patterns, the

FIG. 12.—T-CORE ON BEDDING SAND READY FOR STOVING.

FIG. 16.—COREBOX FOR PRODUCING TWO HALF CORES FORMING THE SPACE BETWEEN THE CASTING ARMS.

resulting error is doubled and excessive cross joints result. The moulds produced from this type of equipment are shown in Fig. 7. Fig. 8 shows the cores in position and the mould ready for closing.

For the casting under consideration chills are employed in the drag part mould, while risers are cut by means of a tube when producing top part moulds. If conditions were such that the two halves of the pattern were not similar, then method (*b*) or (*c*) would have to be used. If it is required that two moulding machines are to be used, then two separate pattern boards must be produced, one for the drag part mould and one for the top part mould.

FIG. 14.—ALL-METAL PATTERN EQUIPMENT FOR FINAL PRODUCTION METHOD.

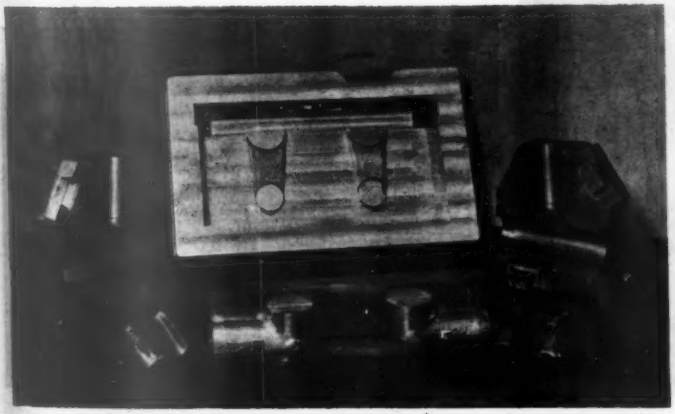


FIG. 15.—COREBOX EQUIPMENT FOR FINAL PRODUCTION METHOD.

Coreboxes for Preliminary Production Equipment

The patternmaker must give careful consideration to the manufacture of cores and the method of their assembly in the mould. He must firstly consider how the sand is to be rammed in the corebox and, secondly, how the finished core is to be withdrawn.

The box must possess an open face through which the sand can be passed and rammed firmly. The open face of the corebox is in the majority of cases the face of the core on which the core stands after withdrawal from the box. The block cores shown in Fig. 9 are capable of being turned out on four alternative faces. The point the patternmaker must consider is the weight of the core-sand and the overhang of that sand.

One of the main troubles in a casting in which cores are used is the dimensional inaccuracy due to the core sagging, or being distorted while still in the "green" or undried state. Careful control of core-sand can help to overcome this trouble, but in overcoming it a compromise has to be effected. A core-sand which air dries quickly will help to prevent the core sagging by the immediate hardening of the surface. But the air-drying condition cannot be controlled so as to apply only after the core is rammed. The air-drying quality, therefore, causes wastage of sand, and in many cases inability to flow and ram easily. On the other hand, a core-sand that has no air-drying quality tends to sag more readily.

In the core illustrated, the corebox should be so constructed that it allows the core to be turned out on that face which constitutes the mould joint, thus keeping the height of the core, and its consequent tendency to sag, down to a minimum. It will be seen from the illustration that this method of turning out the core also gives the minimum amount of unsupported overhang.

The manufacture of the circular section T core presents alternative methods of support during the drying or baking of the core. The actual making of the core is

Development of Pattern Equipment

either by hand-ramming or core blowing method. It is not advisable to use the wooded equipment on the core-blower and the time gained cannot be used to advantage unless core-driers are used for supporting the core. In the equipment concerned this core was turned out by the method shown in Figs. 10, 11 and 12.

Fig. 10 shows how the bedding-out frame is located on the half-corebox containing the completed core.

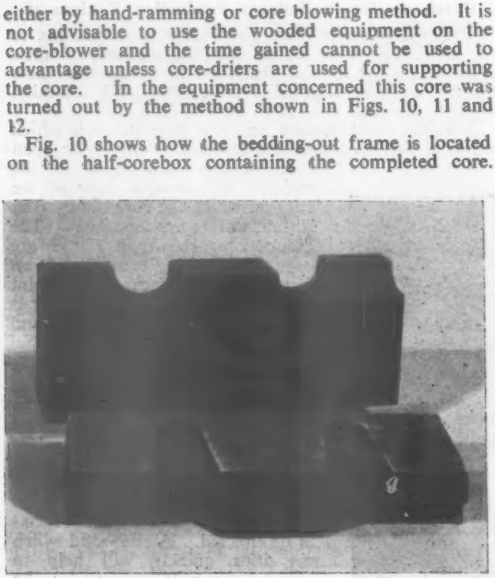


FIG. 17.—CORES PRODUCED FROM COREBOX SHOWN IN FIG. 16.

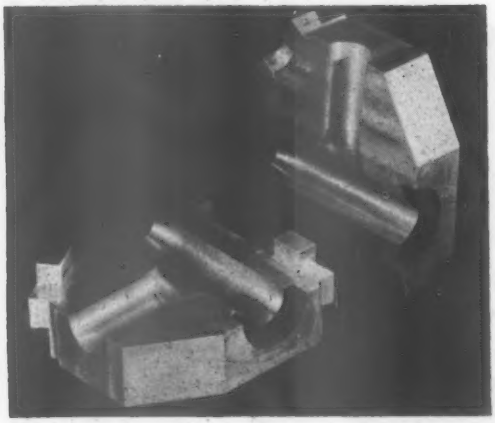


FIG. 19.—ALL-METAL COREBOX FOR THE PRODUCTION OF T-CORE.

Bedding sand, that is, a fairly dry foundry sand with very little bond, is placed carefully around the core, and, after having been firmly and evenly packed, is strickled off level with the top of the frame. Fig. 11 shows the plate held in position and the whole turned over on to the core-plate. It is considered important that stops should be provided for the support of the core-plate on the bedding frame, as it is essential that no movement should take place between the core-box and the bedding sand and frame during the turning-over operation. Fig. 12 shows the core ready for drying.

The castings produced from the turnover pattern board are shown in Fig. 13. It will be seen that the joint marks of the mould and core are excessive. In the design of the final metal production equipment, attention was paid to the experience learned, and the

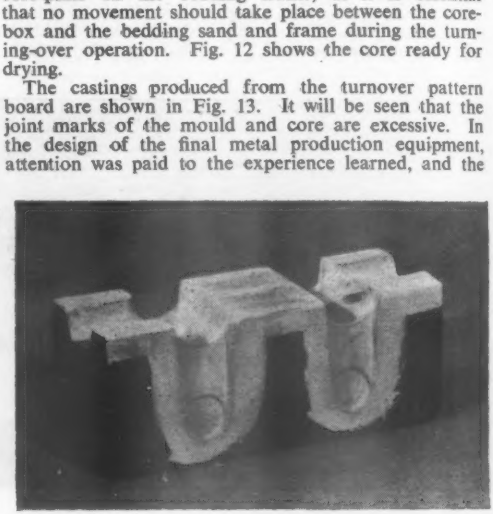


FIG. 18.—TWO HALF CORES JOINTED AND PAINTED READY FOR PLACING IN MOULD.

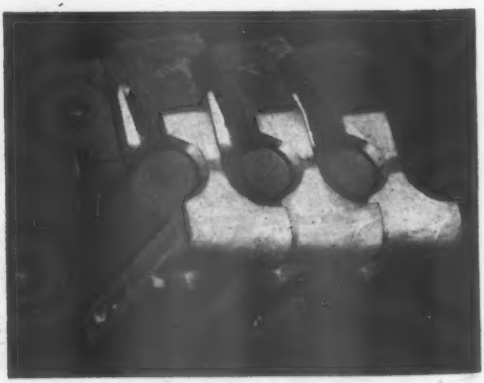


FIG. 20.—CORE DRIERS FOR T-CORE AND METHOD OF STACKING AND STOVING.

resulting equipment produced castings of a very high standard.

Final Production Pattern Equipment

Fig. 14 shows the two metal pattern plates as arranged for the final production methods. It will be seen that alterations were made from the previous turnover pattern equipment. First, two metal plates were made, with the object of being able to produce drags and top part moulds simultaneously on two moulding machines. To avoid a joint line on the casting, the core forming the space between the arms of the casting was extended to the end of the casting; this is shown in Fig. 14. Consideration was given to the main core, and it was decided that the method least liable to give trouble from distortion and sag was as shown in Figs. 14, 15, 16 and 17.

Whereas in the preliminary production equipment four half-cores were used, in the final equipment two of these were made as one large flat half-core (see Fig. 17). This production equipment is made in aluminium and has cast-iron inserts forming the main core-print location. Cast iron is used at these points to prevent wear and damage taking place during storage and handling. The corebox (Fig. 16) is used to produce one half-core, but the pattern is so arranged that the core is symmetrical about the centre line, and the two half-cores are joined together as shown in Figs. 17 and 18.

(*Continued on page* 97, *col.* 2.)

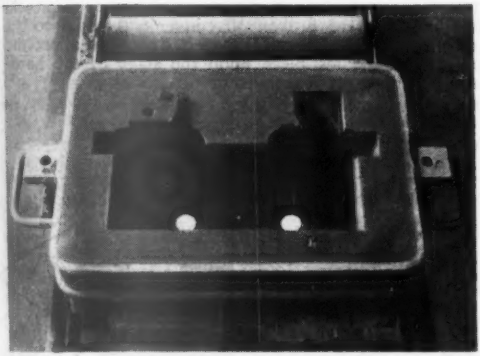


FIG. 21.—DRAG-PART MOULD PRODUCED FROM ALL-METAL FINAL PRODUCTION EQUIPMENT.

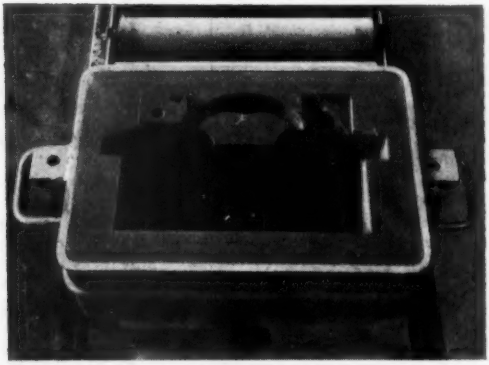


FIG. 22.—TOP-PART MOULD PRODUCED FROM ALL-METAL PRODUCTION EQUIPMENT.

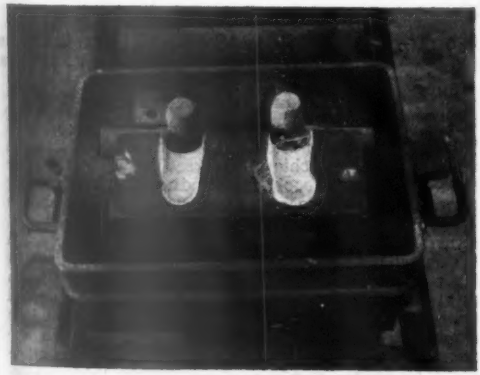


FIG. 23.—DRAG-PART MOULD SHOWING CORES IN POSITION AND MAIN CORE PLACED IN DRAG-PART MOULD.

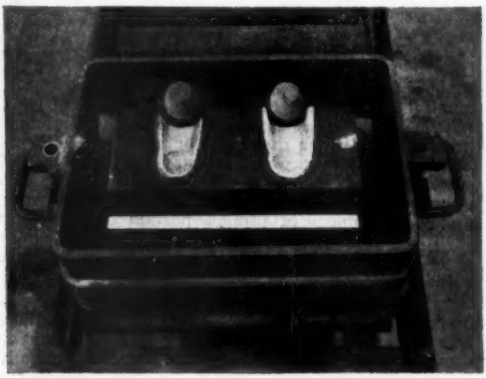


FIG. 24.—DRAG-PART MOULD WITH MAIN CORE BROUGHT FORWARD INTO CLOSING POSITION AND RETAINING PIECE INSERTED.

A CONVENIENT FORM OF CAST-ON INDENTATION HARDNESS TEST-PIECE

By THOMAS B. CROW, Ph.D., M.Sc., F.R.I.C.

Most foundry metallurgists will have experienced difficulties which arise in the selection, isolation and preparation of specimens which are to be subjected to an indentation hardness test. These difficulties arise in several ways; it may not be desirable to break, cut up or otherwise destroy a casting. Again, even should this course be decided upon, the hardness or work-hardening capacity of the casting may be such as will entail the expenditure of an excessive amount of labour both in isolating a test-piece and in its subsequent preparation. If the metal is, for instance, of the Ni-Hard or Ni-Resist class, grinding only can be employed, cutting being out of the question. Then, again, consideration must be given to that much discussed problem of using a portion of the casting itself or "casting-on" a suitable test-piece which can be prepared for the hardness test with a minimum of labour.

It is not proposed to discuss here the merits of cast-on test-pieces *versus* cut-out test-pieces, but since hardness tests on castings are in many cases carried out for routine control of the product and are of comparative value only, sufficiently reliable data, as from cast to cast, will be obtained from a cast-on test-piece, particularly if it is run at the same place every time and other factors are kept as constant as possible. It may be worth notice, in passing, that the test-piece now to be described was devised by the Author for the purpose of routine tests upon each individual casting of a large order for Ni-Hard pipes, each weighing perhaps 150 lbs. So useful has this form of test-piece proved that, whenever anything different from a "jobbing cast-iron shape" is required, it has become general practice to cast one or more "on." In many cases, the hardness values are not actually determined, but the as-cast test-pieces are "filed" away for possible future reference.

The test-piece is shown diagrammatically in Fig. 1. It will be seen to be triangular in shape and supported by three rounded feet at the corners. In the centre is a raised circular portion, which, as cast, is about $\frac{11}{16}$ in. dia. and $\frac{1}{4}$ in. "proud" of the general top surface. The runner, which is made tapered for convenience in moulding, can be broken off conveniently near to the test-piece itself. Provided that it does not affect the balance of the test-piece upon the stage of the hardness machine, its length is of no matter.

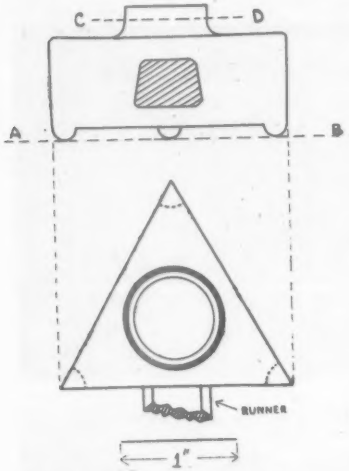


FIG. 1.—FORM OF TEST-PIECE USED FOR HARDNESS DETERMINATION.

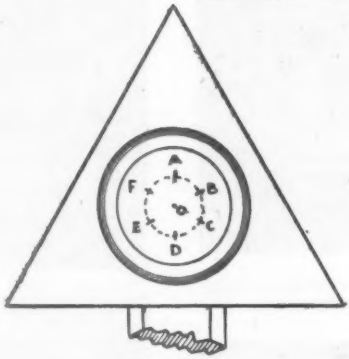


FIG. 2.—LOCATION OF TEST POSITIONS.

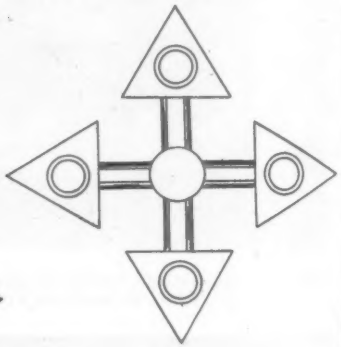


FIG. 3.—METHOD OF OBTAINING FOUR TEST-PIECES FOR INSPECTION PURPOSES.

Preparation of Specimen

The specimen is prepared first by grinding a small "flat" upon the underside of the three feet. This is done by lightly touching the three feet all at the same time upon the *side* of the grindstone or by rubbing upon a piece of coarse emery paper placed upon a sheet of plate glass. It is better to have a slight *area.* rather than what would almost amount to three *points* in contact with the stage of the hardness machine. A layer of metal is then ground off the elevated portion as at CD; the actual method of doing this will depend upon the equipment available locally. It should be emphasised, however, that, although sand cast, a tendency to slight variation in chill should be eliminated by always grinding off a sufficient thickness below the danger line. Overheating must be avoided during grinding and care must be taken that CD is parallel to AB—the plane of the stage—although, as

explained below, the effects of lack of perfection in this respect can be eliminated. Polishing upon revolving emery-paper discs is performed in the usual manner, a slight bevel being of assistance in these operations. If desired, the specimen may be rouge or alumina finished (polished) and etched for micro-examination, where a rough structure check at low magnifications is required.

It will be readily noted that a three-legged specimen *must* be free from wobble when placed upon the stage of the hardness testing machine. It may be argued that a heavy indenting load (say, 50 kilos) applied to an incompletely supported test-piece would give untrue hardness values, apart from such a procedure being "against the regulations." The Author's experience, however, is that a negligible error is caused with so rigid a test-piece practically free from deflection, and in any case comparative values only are being sought.

Making the Test

The actual indentations are carried out at points on the circumference of a circle whose diameter is half that of the polished plane (see Fig. 2). Place the test-piece upon the platform of the hardness machine, so that A is vertically beneath the diamond (or ball). Make and measure the indentation in the usual way.* Rotate the test-piece about 0 in the anti-clockwise direction, through about 60 deg., so that point B now comes under the tool. Proceed as previously. Repeat, by further rotation, until six impressions have been obtained, equally spaced, as at C, D, E, F. We thus have three pairs of impressions at 180 deg. apart. Any malformation of indentation A due to lack of parallelism between CD and AB (Fig. 1) will be cancelled by an equal and opposite effect in D. Similarly errors in other pairs cancel out, and the final answer is given by taking the mean of all six. Should an impression be defective, due to its location coinciding with a tiny blowhole, another one is taken as near to it as is safe.

Another Advantage

A further advantage of this method of dealing with hardness tests of castings lies in the facility for making any number of cast-on test-pieces at selected places on a big casting. It is sometimes desirable if, for instance, test-pieces are to be forwarded to the purchaser with the castings, to run a cluster of four test-pieces as a cast-on or a separate casting, as shown in Fig. 3. The four test-pieces would then be broken off the runner; two retained and two forwarded with the batch which they represent.

This form of test-piece was primarily designed for use on a Vickers' machine, but there is, of course, no objection to its employment on any form of machine where it can be accommodated upon the stage.

The Author hereby acknowledges, with thanks, the permission of John Williams & Sons (Cardiff), Limited, to publish this communication.

* *Both* diagonals of any indentation must be measured.

THE DEVELOPMENT AND APPLICATION OF PATTERN EQUIPMENT FOR THE PRODUCTION OF A LIGHT ALLOY CASTING

(*Continued from page* 95.)

The method of ensuring that the loose side of the corebox does not move during the ramming or blowing operation, is by means of a taper wedge piece fixed on to a handle operated through the side of the corebox. A further point to be observed is the two holes in the base of the main corebox which are designed to ensure that the operator, when lifting the corebox away from the core and the loose piece, can place his two thumbs on the loose piece. This means that without undue rapping, the loose piece does become detached from the main box.

The metal corebox for the T core is illustrated in Fig. 19. It will be noticed that location of the two half-coreboxes is not by the usual dowel method, but a check piece which forms part of the taper clip which forms the fastening for the two half-boxes. Metal formers or carriers are used for the drying of the T cores. These are designed to stack as shown in Fig. 20.

Figs. 21 and 22 show the cope and drag part moulds produced from the equipment. Chills or denseners are used in the drag part mould, while risers are cut in the top part mould. The sequence of closing the mould is, first, to insert the T core, then the main core in the drag part mould, and to slide this core into position. A retaining block is then placed in the space between the back of the mould and the core. The pattern equipment as shown has now been in work for many months and has given extreme satisfaction to the operators and to the inspection department, and has produced many thousands of consistent castings.

AMERICAN FOUNDRY ACTIVITY

The closing stages of the war in Europe saw a distinct improvement in the provision of labour for the grey-iron foundries. In January, for instance, the net gain was 28 per 1,000. The rate of intake was the highest for two years; actually it was 9 per cent., but the loss was 7 per cent.

Despite recent improvements, a real shortage still exists, and there is a tendency to urge industry to use aluminium castings.

FUTURE OF GERMAN INDUSTRY

A number of employers' associations are being asked to nominate panels of experts to advise the occupying military governments on problems connected with their industry and those of the related industries in Germany.

SINCE THE FOREMEN of the Packard Motor Company and General Motors organised themselves into a trades union, the managements have decided that candidates for the higher executive positions will be trained for these jobs from the start, and they will not be filled by promotion.

MOULD DESIGN FOR ALUMINIUM BRONZE DIE CASTINGS*

Need for co-operation between the designer and the foundry

By R. F. LOCKYER

Aluminium bronze has beauty, strength and permanency, is highly resistant to acid attack and to oxidation at red heat, and is extremely resistant to sea-water corrosion. It has exceptional resistance to heavy shock and fatigue stresses, and has surprising properties which are given at the latter end of this Paper. This alloy is attracting the attention more and more of engineers in the form of cheap and intricate die castings.

The process of gravity die casting consists of melting the alloy in a bale-out furnace at a temperature such that it may flow readily and fill the mould completely (approximately 1,150 deg. C.), and pouring it by means of a hand ladle, of capacity roughly equal to the volume of metal required, into the mould, almost immediate chilling taking place. The cores are then withdrawn and the casting removed from the mould. Castings should be removed as quickly as possible, otherwise, due to high contraction on cooling, they will contract into the projections in the mould, making removal difficult. This produces a smooth finished casting which requires little machining.

The mould is cut to form the required shape in suitable material. The writer has found in practice that, where possible, a good grain cast iron with a low-phosphorous content (below 0.3 per cent.) is more suitable than many of the more expensive steel alloys. However, owing to the " shortness " of this material, smaller cores should be made of die steel.

Die Design

The mould should be designed giving consideration to the following points:—(1) The particular position in which the casting will be " run "; (2) the most suitable position for the runner to permit a free flow of the molten metal to every part of the form, and so that the metal solidifies towards the heavier sections, bearing in mind that this must be fettled as economically as possible; (3) the venting of the mould so that air is easily expelled with the onrush of molten metal, thus freeing possible air-locks and making a sharp definition of casting; (4) the construction of the mould so that it withdraws freely without undercuts, and then walls are avoided, which may burn away after a short run; (5) never assume that customers' designs are final. Where required, approach the customer with a view to modification of design to suit die casting; and (6) whilst the economical method of design must be considered, this must not override the main principle of a well-designed mould, that is, maximum production.

* Winning entry for a Short Paper Competition organised by the London Branch of the Institute of British Foundrymen.

Co-operation between the designer and the foundry is essential, both for maximum production and the best product. The writer earnestly advises all die designers to spend as much time as possible in the foundry, where any faults in design will become apparent, thus avoiding any recurrence. The writer has found the production of small moulds considerably hastened by the purchase of a selection of plain blocks of Meehanite iron, which can be cut on a power saw to suit the size of mould desired.

Knowledge of Foundry Procedure

Before proceeding further, it is necessary first to have some knowledge of foundry procedure with regard to aluminium bronze castings. Before producing, the mould is heated to approximately 400 deg. C. It is then dipped in a mixture of graphite and water, the water streaming off immediately and leaving a thin film of graphite. This graphite gives a surface for the molten metal to grip and also acts as a lubricant to the moving parts of the mould. However, it is not always necessary to dip the die blocks after each cast; this can sometimes be done after every five to 10 casts, but exactly how often must be determined by trial on the particular mould in operation. Cores must be dipped after every cast as these are generally surrounded with metal and the drawing of these from the mould removes the graphite film. Die casting moulds have a great advantage over sand moulds, as the complete moulds can be tilted to suit the operator. Moulds for aluminium bronze are generally tilted at an angle of approximately

FIG. 1.—MOULDS FOR ALUMINIUM BRONZE CASTING.

45 deg. towards the runner and brought back slowly to normal level during the end of the pour (see Fig. 1).

With a top feed this angular movement towards the runner enables the operator to keep oxide inclusions and foreign material in the runner. The writer has found by experience that a top feed on aluminium

bronze is very successful, making the tool smaller and therefore faster to operate, and giving greater life to the mould. It is to be noted that thin sections solidify in their entire thickness, but heavier sections solidify in layers approximately parallel to the mould walls.

It is difficult to lay down hard and fast rules for die designing, as this is the work of a specialist, and most knowledge is gained after actual practice. In the simplest case the mould is made in two halves with its casting contour and runners, etc., such that the casting will withdraw freely away from the mould (see Fig. 2).

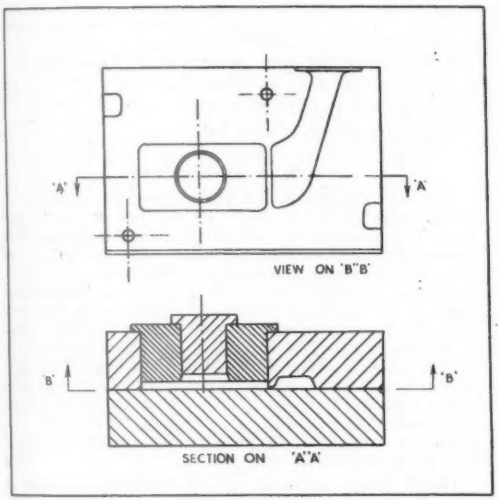


FIG. 2.—DESIGN OF MOULD FOR EASE OF STRIPPING.

Runners and Risers

It is advisable, where practicable, to position the runners or, secondly, the risers, on the heaviest sections of the casting, otherwise shrinking may occur on the casting face, or an internal draw will become apparent on X-ray examination or on sectioning the casting. Aluminium copper alloys pass almost immediately from the liquid to the solid state, and, in doing so, the metal is reduced to nine-tenths of its liquid volume before the commencement of ordinary lineal contraction. With regard to the thinness of section obtainable, this is dependent on the section change. However, it is inadvisable to attempt castings of section less than $\frac{1}{4}$ in. Any rapid change of section, which cannot be eliminated by mutual agreement with the customer, should receive special consideration from the die designer, as such rapid change will cause some considerable technical difficulties during foundry production. Therefore space should be left on the mould for any modification to design, such as increasing the size of runner or riser.

Internal shrink holes must not be confused with blowholes. The former are caused by lack of feed, or shrinkage, the solidification shrinkage being about twice that of brass, whilst the latter are caused through a pocket of air or gas. Blowholes in aluminium bronze can be defined from shrinkholes as, in the former, the wall surrounding the hole will be round and smooth, whilst, in the latter, it will be piped towards the heavier section and not always smooth.

If a draw hole is found to be occurring in the die casting, this can generally be cured by means of a riser over the guilty spot. A riser will also help the casting to run in some difficult section. However, if a riser can be dispensed with, this will be a double advantage, as the cost of fettling the casting will be considerably reduced and the casting will carry sharper edges. Risers give the metal a tendency to run through the mould and not make perfectly sharp edges. "Cold shuts" are formed where the smooth flow of the liquid metal is broken, owing to solidification of one or more of the streams of metal before the mould is completely filled. As soon as pouring commences the stream of alloy is coated with aluminium oxide and, if spraying or splashing occurs, each portion receives its own envelope of oxide. This coating prevents absolute reunion with the main body of metal. Therefore, in designing these moulds, always, where possible, allow one main runner only, thus avoiding spraying or splashing.

Of all the die casting alloys, aluminium bronze requires the smallest gates. The designer should in all cases keep the size small and enlarge after sampling, if necessary. It should be borne in mind that this alloy tends to draw back towards the runner, thus forming a shrink hole in the casting at the gate if the gating is too large. After pouring, the cores are withdrawn and the casting removed from the mould by pliers or tongs. Contraction necessitates taper on the walls of the casting and cores. It is advisable to obtain the maximum permissible taper by agreement with the customer, as the greater the taper, the quicker will be the production from the mould. The main parting line of the mould and decision regarding the number of parts in which the mould is to be built depend upon the casting in question.

Vents for the escape of air as metal enters the mould must be provided so that air can escape quickly from the onrush of molten metal whether a riser is incorporated in the design or not. For this reason the moulds are built of separate pieces and shallow grooves allow the air to escape, thus giving sharpness of edges to the finished casting. Die faces are also sometimes vented, and it is general practice to add vents on the faces where found necessary after samples have been run from the mould. Aluminium bronze is mainly a copper alloy containing up to 13 per cent., but usually not more than 10 per cent., of aluminium. Iron is also a main constituent, and quantities of nickel, manganese and other elements are also added.

Mould Design

There are shown below two main die-casting alloys which are of general use in the trade:—

British Standard Specification. B.S. 1032—1942

ALUMINIUM BRONZE CASTINGS.

The chemical composition of the castings shall be:—

Aluminium.—Not less than 8.50 per cent. and not more than 10.50 per cent.

Iron.—Not less than 1.50 per cent. and not more than 3.50 per cent.

Nickel.—Not more than 1.00 per cent. It is not intended that nickel should be intentionally added.

Manganese.—Not more than 1.00 per cent. It is not intended that manganese should be intentionally added.

Zinc.—Not more than 0.50 per cent.

Total elements other than copper and those set out above.—Not more than 0.30 per cent.

Copper.—The remainder.

Ultimate Tensile Stress.—Not less than 32 tons per sq. in.

Elongation.—Not less than 20 per cent.

D.T.D. 174.A.

The chemical composition of the alloy shall be:—

Aluminium.—Not less than 7.5 per cent. nor more than 10.5 per cent.

Iron.—Not less than 1.5 per cent. nor more than 3.5 per cent.

Total Impurities.—Not more than 0.3 per cent.

Copper.—The remainder.

The following elements may be present at the option of the manufacturer:—

Nickel.—Not more than 4.0 per cent.

Manganese.—Not more than 3.5 per cent.

Ultimate Tensile Stress.—Not less than 32 tons per sq. in.

Elongation on 2 in.—Not less than 20 per cent.

The general mechanical properties for varying aluminium content are shown (chill-cast):—

Aluminium, Per cent.	Tensile, Tons/sq. in.	Elongation, Per cent.
1	12	46
2	13.5	50
3	14.5	60
4	16	69
5	17.5	70
6	18	70
7	20	70
8	26	60
9	33	44
10	37	26
11	35	10
12	30	4

Mechanical properties on various chill-cast test-bars poured in a U-type mould are shown:—

Test-bar.	Aluminium, Per cent.	Iron, Per cent.	Copper, Per cent.	Tensile, Tons/sq. in.	Elongation, Per cent.
1	9.04	2.75	88.14	36	40
2	9.23	2.70	88.02	37	41
3	8.97	2.72	88.23	36	42
4	9.20	2.65	88.09	36	44
5	9.06	2.73	88.14	36	39

The other general properties are:—

Proof Stress.—15 tons per sq. in. (0.1 per cent.).

Reduction in Area.—38 per cent.

Izod Impact Value.—30 ft. lbs.

Brinell Hardness.—110 to 130.

Modulus of Elasticity

The modulus of elasticity, or Young's modulus, is of the order of 17.5 to 19 $\times$ 10^6 lbs. per sq. in. for the range of commercial aluminium bronze alloys. The linear coefficient of thermal expansion per deg. C. of aluminium bronze containing about 10 per cent. aluminium is about 17 $\times$ 10^{-6}, within a temperature range of 20 deg. C. to 100 deg. C. This value increases with the rise of temperature and over a thermal range of 20 deg. C. to 250 deg. C. the average thermal coefficient value is about 18 $\times$ 10^{-6}. The impact strength of alloys of 9 per cent. to 10 per cent. aluminium content is roughly 25 to 40 ft. lbs. With alloys of 18 per cent. aluminium, it may be as high as 50 to 60 ft. lbs. When the content is 11 per cent. the impact strength falls to 10 ft. lbs. or less.

These alloys respond to heat-treatment, having a specially favourable effect on yield properties. If castings are heated to 900 deg. C. and quenched, then reheated to 600 deg. C., the yield may be increased from 11 to 14 tons per sq. in. to 18 tons per sq. in., with little or no change in tensile strength and elongation.

SIMPLIFIED WORKING DRAWINGS

An article in the "Production and Engineering Bulletin" for May makes a plea for the simplification of working drawings so that they better align themselves with the breaking down of complicated jobs in simple operations.

AN EXTRAORDINARY GENERAL MEETING of the Foundry Equipment and Supplies' Association was held on May 24, at the Grosvenor Hotel, Victoria, London, S.W.1, to alter the articles of association. Mr. D. Cherry Paterson presided. A campaign is shortly to be launched to increase the membership of the association.

A DEPARTURE FROM STANDARD PRACTICE*

Economy in ordering and storage of firebricks for the small foundry

By W. WILSON

In the small foundry it is often difficult to maintain stocks of the various shapes and sizes of brick required for the maintenance of the assorted stoves and furnaces necessary to their livelihood, so that any attempt at standardisation of these variables gives economy in ordering and storage, together with the simplifying of these not inconsiderable items.

One foundry, catering for both non-ferrous and iron castings required a minimum of three sizes of firebrick, only one of which fell in the standard 9-in. by 4½-in. by 3-in. size, procurable locally, while the others had to build up to circular steel shells of 27 in. i.d. for the cupola and 16 in. i.d. for the non-ferrous furnaces. To offset the problem, accentuated under war-

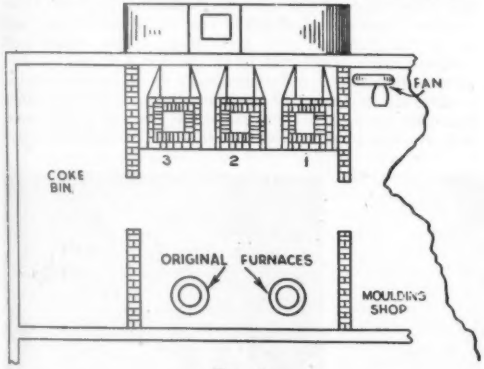


FIG. 1.

time conditions, they ordered 50 per cent. in excess of their requirements of the cupola brick which filled the available storage space, but ensured production from the major unit.

An Effort at Standardisation

Working on the standardisation idea, experiments were started with rammed linings in the two non-ferrous furnaces of 16 in. i.d., but from scarcity of skilled labour came the first rebuff as, due to careless work, the slagged face very often became broken, when the second trouble came to light, as ganister patching would not hold on a crumbling face. The original ramming of ganister and broken firebrick or graphite crucible had to be made during a week-end, as continuous melting took place during the six-day week on 15 hrs. daily, and the maximum free time allowable was from Saturday mid-day till Monday 8 a.m., hence giving insufficient time for proper drying out before lighting, even ramming one furnace at a time on alternate weeks with the obvious result—a slagged face with a crumbling rear—thus fresh patching had no support.

As one of the furnace shells was of a large diameter to allow for a double lining, a second series of experiments commenced deviating from the usual circular shape to a square furnace built up from the standard or stove bricks procured locally from a builder's merchant, though naturally these could not be expected to give the life working under the heavy

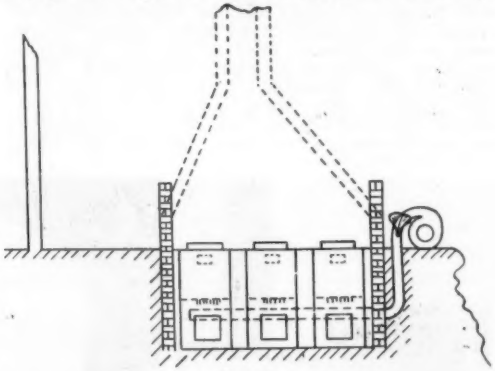


FIG. 2.

duty of melting conditions, but nevertheless served for experimental purposes.

The original diameter of the furnaces was 16 in., or 4 in. more than the pot, giving a 2-in. space for coke charging during the melt, and when the square section lining was installed, 14 in. by 14 in. was decided on, as it gave approximately the same area with less space between the pot and the sides, but compensated in the angular corners where coke could be fed quite easily. This shape, using brick, did not give any superiority over the circular design except in the case of coke feeding, but was a definite improvement on the ganister lining as regards the life.

A Rebuilding Programme

On the success of this trial the standardisation of brick sizes had been given a definite step in the right direction, and based on that, it was decided to rebuild

* A prize-winning entry for a Short Paper Competition organised by the London Branch of the Institute of British Foundrymen.

A Departure from Standard Practice

the furnaces completely, and incorporate various ideas gained from inside experience for fume removal, heat conservation and blast control, with safer conditions for working for the operative, and at the same time augmenting the melting capacity by increasing the number of furnaces to three. A square-type furnace was decided on, since it seemed the easiest to build, and the experiments had given comparative results for that shape of furnace.

The furnaces were of simple construction, being cast-iron shells, 3 ft. by 3 ft. by 6 in., built up from plates cast in the iron shop, with the necessary openings and bolt holes, these being assembled on the floor so that, when all components were ready, the changeover could be made with the maximum speed.

In Figs. 1 and 2 the situation for the new layout is shown, and it can be seen that this afforded the easiest position to accommodate the chimney and give the minimum labour in accomplishment. With the blower sited on the right, the pit was excavated and bricked with foundations ready for the furnaces to be re-erected and the common blast main installed with off-takes to each furnace, fitted with sliding shutters to cut off or regulate the air supply as necessary. These shutters were controlled by a simple bell-crank lever action from above floor level, on each furnace independently, so that the furnaceman need not leave his charge at any time. The blast main being coupled to the blower fan, another valve was inserted here, so that the air could be quickly increased or decreased when furnaces were shut down or lit up, thereby upsetting the balance on the rest.

At this stage the furnaces were erected and coupled up to the blast main, and a common flue constructed in a breast-work tapering upwards to a chimney 18 in. by 18 in. internally, with a height of 35 ft., the connecting ducts to the furnace being approximately 9 in. by 6 in., built up of brick and ganister slabs on cast-iron plates resting on brackets bolted to the rear of each furnace above the blast main.

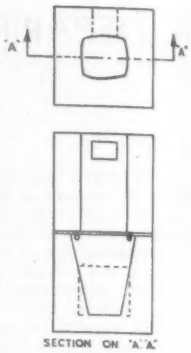


FIG. 3.

Reference to Fig. 3 will assist the reading of the following:—In building up the furnace the shell was first lined throughout with the standard 9-in. by 4½-in. by 3-in. common firebricks, and an inner lining built in to the required size and shape. The ashpit and windbox were combined in the lower 3 ft. of the furnace, which was lined with brick in a tapered shape as shown, the lower or narrower portion being within the door size, so that metal skulls would concentrate into a narrow pig which would be extracted easily,

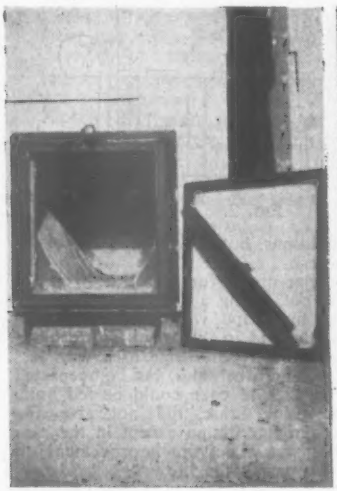


FIG. 4.—SHOWING WINDBOX AND DROP BOTTOM DEVICE.

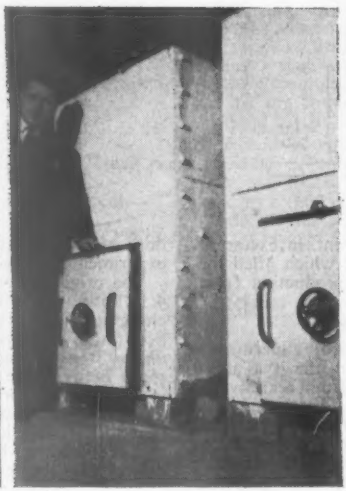


FIG. 5.—VIEW OF FURNACE PIT SHOWING HEAD ROOM AND LOCKING ARRANGEMENT OF FURNACE DOORS.

FIG. 6.—CHARGING FLOOR AND FURNACE TOPS.

and also would be of suitable shape for remelting. Following this line still further, the firebar arrangement was made to obviate the troubles ensuing from metal freezing on the bars, which very often necessitated the complete stripping of the furnace before they could be removed, and also to ease the clinkering after a heavy day's blow when the clinker had closed over part of the bar surface. In the opinion of the Author, this is a point which has been neglected by furnace manufacturers. Working on an idea evolved from the "drop bottom" cupola, a hinged front rester bar could be freed by the withdrawal of a bolt from the outside of the casing, allowing the fire to drop into the ashpit, and at the same time giving complete safety from dirt, fumes or burning for the furnaceman in any eventuality. This leaves a clear furnace for chipping down, while the clinker, etc., can be withdrawn through the door, giving the option of inserting fresh bars and relighting immediately, if necessary.

On a suggestion from the foreman, it was decided, for the first linings, to try two furnaces with the standard brick and the third with a melting zone built from the cupola brick, or a square furnace with "round" sides, as these bricks were intended to build up to a circle of 27 in. i.d.; thus it gives a furnace as shown in Fig. 3.

Results Obtained

These linings have now given three months' service with the following result:—A hard furnace coke, graded to 2 in. to 2½ in. mesh, was used showing a figure of 28/30 lbs. coke per 100-lbs. metal melted, and all three furnaces gave greatly improved performances over the previous type. Melting times under forced draught were much alike, but under natural draught varied largely, probably due to the relative position of each furnace under the chimney. Furnace No. 1 lined with the cupola brick, while costing 30 per cent. more initially, gave a very much greater life than the other two, as can be seen by a comparison of the melting lives to the patching time, and the condition of the furnaces at the end of the three-month period.

No. 1 showed severe cutting along the vertical brick joints, as these had been set one above the other to allow for the unusual shape, but this could be patched easily, and the fault will be remedied on the next lining. No. 2 had burned back in the lower 18 in. by about 2 in. in some places, while several patches of cracking brickwork were apparent. This required heavy daubing. No. 3 required relining, as the bricks in the back wall had commenced to spall to a depth of 2 in. over and above wear similar to furnace No. 2.

Table I shows the comparative figures for these furnaces.

Crucible Life

The crucibles used also gave some interesting data, but this issue was not altogether clear as some change in composition of these took place about the time of the new installation, but some notable points were in some increase in the number of melts per pot and the appearance of the pots after 75 per cent. of their useful life was over. On the old furnace more severe bottom wear took place, and all pots became bull-nosed, while the original shape was maintained in the new furnace. Also wear seemed to be more even instead of the partial cutting in places which gave much trouble previously. This seemed to show a better spreading of the blast instead of a jet action giving a localized heating near the base of the fire, and up to date, no pots have broken in the furnace, but this may also be due to a new furnaceman, an intelligent type picked from among the foundry personnel, and trained by the foreman, amply repaying the time spent training, as the data shown here can testify, in that due to their care and attention this Paper has been made possible.

Table I.—*Performance Results.*

Furnace No.	1.	2.	3.
Brick	Stein Nettle.	Common Fireclay.	Common Fireclay.
Melting time in mins. per 100 lbs. metal :			
Natural draught ..	37/48	40/51.25	41/51
Forced draught ..	27	27	27
No. of 150-lb. melts ..	226	172	166
Patching time	16 hrs.	19 hrs.	17½ hrs.
Average patching time per 100 lbs.	2.83 mins.	4.42 mins.	4.22 mins.

NEW PATENTS

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

568,573 ROBIETTE, A. G. E., and BIRMINGHAM ELECTRIC FURNACES, LIMITED. Decarburisation of austenitic manganese steel.

568,608 FORSSELL, C. A. Cold working of steel.

568,621 SINGER, F., and BEKEN, F. Method of preparing foundry sand.

568,637 ELECTRIC FURNACE COMPANY, LIMITED (Ohio Crankshaft Company). Electric induction heating.

568,665 STONE & COMPANY, LIMITED, J., CALLIS, G. T., and MURPHY, A. J. Copper-base alloys containing zinc.

568,701 BRITISH IRON & STEEL CORPORATION, LIMITED, and DOUGLAS, A. Electromagnetic apparatus for measuring and indicating small displacements.

568,751 ANDRE RUBBER COMPANY, LIMITED, and BUCHAN, S. Treatment of metal surfaces prior to bonding rubber thereto.

568,772 RIACH, W. D., and G. W. B. ELECTRIC FURNACES, LIMITED. Charging batch furnaces.

568,776 STRODE, M. (Larssen, G. Hagerup-). Self-baking electrodes for electric furnaces.

568,873 PETERBOROUGH DIE CASTING & MACHINE COMPANY, LIMITED, and STOCK, H. A. Hydraulically operated die-casting machines of the pressure type.

IN PARLIAMENT

Industrial Reconversion

SIR O. SIMMONDS asked the Minister of Production the extent to which authority had now been given to industrial organisations in the Birmingham area to transfer their production from war purposes to those of commerce and industry.

MR. LYTTELTON: In the Birmingham area, as elsewhere, authorisations designed to lead to increased civil production are being granted on the scale justified by the curtailment of war production, the extent of which is governed by the needs of the war against Japan. The degree to which an undertaking can be authorised to turn over to civil production depends not only on the further war production required of it, but on the demands for labour for other work of importance in the neighbourhood. The question does not lend itself to a more precise answer, but if my hon. friend has any particular issue in mind perhaps he will communicate with me about it.

SIR O. SIMMONDS: Is my right hon. friend aware that there is some fear in Birmingham that he is suffering from inter-departmental obstruction in this matter, and will he do his best to solve this local squabble in Whitehall so that Birmingham can get on with the business?

MR. LYTTELTON: I am quite unaware of the circumstances of which my hon. friend is speaking.

Shipbuilding Orders

MISS WARD asked the First Lord of the Admiralty whether, in view of Dutch shipbuilding orders being placed with the U.S.A. owing to our inability to give delivery, he could give an assurance that the shipyard workers and engineers at present employed in Tyneside shipyards and engine works would be fully occupied for the next ten years.

MR. ALEXANDER: The Dutch Government and our other European Allies have recently been offered the opportunity of placing orders for merchant ships in this country in order to assist them in replacing war losses. It is expected that substantial orders from Holland will soon be placed in the United Kingdom. His Majesty's Government will, of course, seek to ensure full employment in the shipbuilding industry in accordance with their employment policy, but I cannot at present forecast the future scale of the industry as a whole or in any particular area.

"FOUNDRY PRACTICE," the house organ of Foundry Services, Limited, Long Acre, Nechells, Birmingham, 7, in its issue for March-April contains articles on gas in core sands; faults in non-ferrous castings; burning-on, and liquid shrinkage.

FOR A 2,100 H.P. AIRCRAFT ENGINE weighing only 1,640 lbs., the Continental Aviation & Engineering Corporation of America are casting each cylinder individually rather than *en bloc*, with the object of practising refinements through improving the cooling conditions.

PERSONAL

MR. GEOFFREY BARFORD has retired from the board of Aveling-Barford, Limited, and MR. FITZHERBERT WRIGHT and MR. JAMES BARCLAY have been appointed works and commercial directors respectively.

MR. FRANK BIRCH, of Fallings Park, Wolverhampton, who is technical adviser to Henry Hope & Sons, Limited, of Smethwick and Wednesbury, has been elected a member of the Wolverhampton Town Council.

SIR ARCHIBALD M'KINSTRY, who, until he retired recently, was managing director of Babcock & Wilcox, Limited, Renfrew, is to receive the freedom of the borough of Renfrew. The ceremony will take place in Renfrew Town Hall on June 8.

MR. JAMES SOUTER, formerly chief metallurgist and assistant departmental manager in the foundries of Qualcast, Limited, Derby, and MR. J. B. HOLLIS, formerly assistant chief metallurgist at Newton, Chambers & Company, Limited, Sheffield, have joined the technical staff of International Meehanite Metal Company, Limited.

MR. H. N. SPORBORG is retiring at the end of June from the position of chairman of the British Thomson-Houston Company, Limited, after completing 43 years' service with the company. Mr. Sporborg is also retiring from the positions of vice-chairman of Associated Electrical Industries, Limited, chairman of the Cosmos Manufacturing Company, Limited, chairman of Lamp Caps, Limited, director of the Metropolitan Vickers Electrical Company, Limited, and director of the Switchgear Testing Company, Limited.

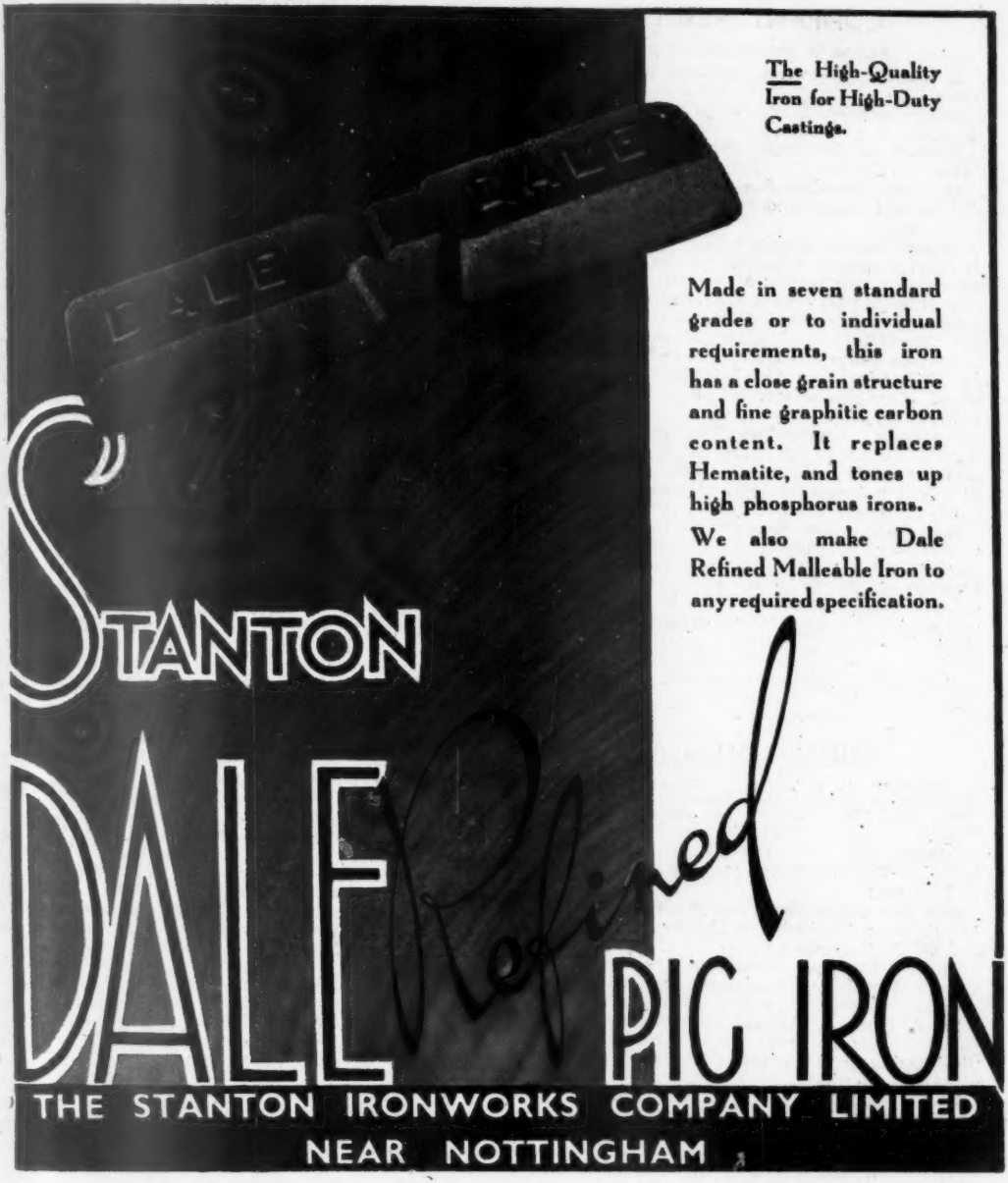
Wills

BARRY, D. H., chairman of Mason & Barry, Limited	£133,043
URMSON, JOSEPH, of Ashton-under-Lyne, retired iron-founder	£11,628

FINANCE CORPORATION FOR INDUSTRY

The Finance Corporation for Industry, Limited, the formation of which, with resources of £125,000,000, was announced some months ago, has now been registered and the first directors have been selected. The board will consist of:—Lord Hyndley (chairman), Prof. C. D. Ellis (on release from Government service), Mr. Thomas Frazer, Sir John Morison, Sir A. Jeremy Raisman, Sir Robert J. Sinclair, Mr. J. Ivan Spens, Lieut.-General Sir Ronald M. Weeks (on release from military duties) and Lord Westwood. The Finance Corporation for Industry was formed by the Bank of England, the joint stock banks, and the insurance companies, to assist in the financing of British industry after the war. Its share capital of £25,000,000 is to be subscribed by the Bank of England, the banks, and insurance companies, and its loan capital of up to £100,000,000 will be supplied by the banks.

THE BRITISH CAST IRON RESEARCH ASSOCIATION has decided to issue its Bulletin six times annually instead of four times as has been the practice during the war.


The High-Quality Iron for High-Duty Castings.
Made in seven standard grades or to individual requirements, this iron has a close grain structure and fine graphitic carbon content. It replaces Hematite, and tones up high phosphorus irons.
We also make Dale Refined Malleable Iron to any required specification.
STANTON
DALE Refined PIG IRON
THE STANTON IRONWORKS COMPANY LIMITED
NEAR NOTTINGHAM

COMPANY RESULTS

(Figures for previous year in brackets.)

E. G. Brown—Interim dividend of 2.4d. per 2s. share (same).

Barrow Hematite Steel—Net profit, £81,579 (£81,010); dividend of 7½% (same).

Howard & Bullough (Securities)—Net profit to March 31, £34,598 (£38,749); dividend of 5% (same).

Hoffmann Manufacturing Company—Profit for 1944, £77,606 (£217,930); dividend for year of 7½%, tax free (17½% net).

Walter Somers—Dividend of 1s. per share, less tax. It is not proposed to recommend any further dividend in respect of the year to March 31, 1945.

Boulton & Paul—Net profit, after providing for depreciation, together with dividends received from subsidiaries, £120,932 (£123,861); dividend of 10% (7½%).

Grayson Rollo & Clover Docks—Net trading profit for 1944, after tax, £51,142 (£52,038); other income, £4,142 (£3,608); dividend of 10% (same); forward, £14,185 (£34,410).

Sturtevant Engineering—Net profit for 1944, £25,074 (£25,553); to rebuilding reserve, £10,000 (£6,000); contingencies, nil (£4,000); final dividend of 2½% and a bonus of 3¼%, making 11¼%, tax free (10%, tax free); forward, £10,511 (£9,137).

John Summers & Sons—Profit for 1944, £966,500 (£1,048,098); net profit, £428,718 (£427,963), after £84,261 (£86,235) for gross debenture interest, and £450,000 (£530,000) for tax provision; to general reserve, including £45,646 (£43,681) in respect of debenture stock redeemed, £150,000 (£160,000); to war contingencies reserve, £50,000 (same); "A" ordinary dividend of 8½% (same); "B" ordinary dividend, 4½% (same); forward, £201,864 (£188,146).

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Manco, 10a, Camp Lane, Kings Norton, Birmingham, 30—Welders, casters, metal workers, etc. £2,000. R. E. Mason.

Blue Star Engineering Company, Halifax Works, St. Mary's Lane, Tewkesbury—£2,000. J. A. Cavanagh and G. G. Robinson.

Merry & Company (Manchester), 109, Great Ancoats Street, Manchester—Engineers' and ironfounders' suppliers. £2,000. F. and F. R. Eades.

W. J. Parry & Company (Nottingham), Lombard House, Lower Parliament Street, Nottingham—Electrical and general engineers. £10,000. W. J. Parry and H. C. Martin.

Heaps, Collis & Harrison, 15, Grange Avenue, Auckland Park, Bishop Auckland, Co. Durham—Designers and manufacturers of air and gas compressors, pneumatic machinery, etc. £5,000. L. F. Heaps, F. W. Collis, and A. Harrison.

NEWS IN BRIEF

BIRMINGHAM UNIVERSITY is appealing for an immediate development fund of £1,500,000.

MR. R. A. BUTLER, as Minister of Education, said at Ipswich recently that technical education had made a major and possibly even decisive contribution to the war effort. He regarded the provision of adequate facilities for technical education as a major national need, and would do everything in his power to help authorities to meet the most urgent requirements.

LT.-COL. EDGAR PAM, in his presidential address to the Institution of Mining and Metallurgy, said that the ore reserve of most of the important base-metal mines had been seriously depleted and no ore bodies of real importance had been discovered for many years. It was probable, therefore, that metal would have to be produced in future from poorer ore in existing mines or from small and low-grade deposits hitherto considered uneconomic.

SIR WILLIAM Y. DARLING, chairman of the Scottish Council on Industry, speaking in Edinburgh on May 18, said that in Scotland there was a deficiency in modern factory accommodation as compared with England. Some 3,000,000 sq. ft. was the estimated figure to meet the needs of industry and to replace uneconomic accommodation. If Scotland was to prosper industrially there should be available accommodation in every area for diversified types of manufacture.

MANY YARDS on the North-East Coast are changing from war to peace shipbuilding construction. Some yards are still well placed with regard to Government work, while others have already booked orders for private firms and are expected to be busy for two or three years. It has been announced that during the war the River Tyne received 1,600 ships for repairs. During the war North-East shipyards built nearly 500 merchant ships with a tonnage of 2,824,081. Wm. Doxford & Sons, Limited, Sunderland, with 71 ships of 480,000 tons, and William Gray & Company, Limited, West Hartlepool, with 74 vessels of 347,000 tons, had the highest outputs in the district.

A HAMILTON ENGINEERING COMPANY were fined £20 recently on pleading guilty to having on January 26 failed to make effective provision for securing and maintaining a reasonable temperature in their works. It was stated that at one machine the temperature was 35 deg. F., at another 30, while at a third it was 28 deg. The factory was heated by braziers and slow-combustion stoves, which were moved about the shop as required. On behalf of the firm, it was stated that they were reluctant to introduce a new form of heating, as the present was a transition period. There was no saying what the requirements and character of the firm's business would be in the immediate future.

OBITUARY

MR. JAMES HERBERT RICHARDSON, who was a director of the British & Colonial Horse Shoe & Machine Company, Limited, Walsall, with whom he had been connected for more than fifty years, died recently at the age of 68.